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## NOTES FOR STUDENTS

**Vegetation of the high Andes.**—WEBERBAUER draws this picture of the andine vegetation:<sup>8a</sup> In the high Andes of central Peru most plants are not structurally xerophilous, and dessication by the high altitude is much restricted by the abundant precipitation and the prevalence of clouds. Were the danger of drying so great, one would expect that the moistest locations would bear the most species and the most vigorous forms, and that on the moist ground the vegetation would ascend higher than elsewhere. But the vegetation of the high Andes presents no such picture; the high-andine moor contains fewer species than the meadows of cushion and rosette plants, and none of those stouter forms which in their aspect recall the lower regions—the shrubs, tufted grasses, and tall-stemmed herbs; these grow by preference rather on the dry slopes, the stony ground, and the rocks; and upon a stony substratum the limits of vegetation run higher than upon well-watered ground. The explanation of these phenomena is to be sought, in my opinion, in the temperature of the ground. By the low temperature of the soil many plants are kept away from the moors, while the simultaneous high temperature of the rocks is favorable for vegetation. That temperature of the soil at these elevations plays an important rôle is indicated by the horizontal position of roots, referred to in an earlier paper,<sup>8b</sup> and by the very aspect of the vegetation.—C. R. B.

**Transmission of tropistic stimulation.**—FITTING<sup>8c</sup> has undertaken to ascertain in what manner the tissues of perception and reaction are connected that the stimulus indirectly determines the direction of the curvature. The work consists mainly of a study of phototropic response (coleoptile of the grasses, chiefly *Avena*) as affected by more or less complete disconnection of the tissue between the apex and base. Wounding by transverse incision or by splitting does result in a feeble traumatic response, but neither the growth nor the capacity for perception and response is significantly affected. It may be said that the reliability of the author's conclusions hinges largely upon the truth of this statement, but the reviewer finds no reason for doubt and the work of ROTHERT is in accordance with it. The author shows that whatever course transmission is compelled to follow, the curvature is entirely independent of the unilateral occupation of the perceptive organ by the stimulus. Individual segments of halved or quartered coleoptiles will respond if the segment includes a small portion of the apex. Even in leaves from whose central portion a large square of tissue has been removed, transmission occurs. The stimulation seems to spread with equal ease across or along the organ. The author regards it highly probable that phototropic transmission

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<sup>8a</sup> WEBERBAUER, A., Weitere Mitteilungen über Vegetation und Klima der Hochanden Perus. Engler's Bot. Jahrb. 39:449-461. pls. 4, 5. 1907.

<sup>8b</sup> *Op. cit.* 37:60 ff. 1905.

<sup>8c</sup> FITTING, HANS, Die Leitung tropistischer Reize in parallelotropen Pflanzenteilen. Jahrb. Wiss. Bot. 44:197-253. fig. 26. 1907.

proceeds through the living substance. The paper maintains the high standard we have come to expect from this author.—RAYMOND H. POND.

**Ants and plants.**—ULE has already smitten hard the theory of myrmecophily, according to which the complicated cavities and other structures have arisen by natural selection through the protection afforded by the symbiotic ants against injury by other ants and browsing animals. Now he concludes<sup>9</sup> that it must be given up almost entirely, because his more extended observations in the Amazon region, where such plants most do congregate, cannot be reconciled with the theory.

The ant plants grow most abundantly in flooded regions, where no leaf-cutting ants are found; the devastation by leaf-cutters is not so extensive as it has been reckoned by VON IHERING; the weapons of the protective ants are not efficient, especially against thick-skinned animals, and are not capable of such wounds as those of many other ants; and the protection afforded, while possibly advantageous in the struggle for existence, is not sufficient to call forth the elaborate cavities and other "adaptive" structures. In explanation of the symbiosis, ULE would rather lay stress upon the initiative of the ants, which chose aptly the plants that suited their needs, and perhaps have modified them by the intimate and constant symbiosis, in much the same way as man has improved the wild ancestors of his useful plants. But the cavities must have *originated* through deeper-lying causes.

ULE adds a list of the ant plants found on his Amazon expedition, which includes 46 species in 11 families, the Melastomaceae having 17, and the Leguminosae and Moraceae each 7. He figures the extraordinary "tubers" (really Dischidia-like pitcher leaves) of *Polypodium bijrons* Hook., which serve as water sacs and incidentally as dwellings for *Azteca Traili*.

A still more vigorous objection is made by VON IHERING,<sup>10</sup> who has studied the relations between *Cecropia adenopus* Mart. and its inhabitant, *Azteca Muelleri* Emery, in a much more thorough fashion than was done by FRITZ MUELLER and SCHIMPER. He has given special attention to the life-history of the ants and the metamorphosis of their nests. The "Müllerian bodies," which grow on the leaf bases, are not used to feed the larvae but as food by the ants themselves, though they are by no means restricted thereto. The small tumors, produced from the inner parenchyma near the entrance to the hollow of the stem as a result of gnawing the prostoma open, contain sugary and fatty substances and serve as food. VON IHERING rejects absolutely the elaborate conceptions of "mutualism" and "myrmecophily," and declares in so many words that *Cecropia adenopus* can get along quite as well without ants as a dog can without fleas. He considers the ants mere parasites, completely adapted to this plant, without which they cannot prosper at all; but all the plant "adaptations" are like those that hosts everywhere show to parasites.—C. R. B.

<sup>9</sup> ULE, E., Ameisenpflanzen. Engler's Bot. Jahrb. 37:335-352. pls. 5, 6. 1906.

<sup>10</sup> IHERING, H. VON, Die Cecropien und ihre Schutzameisen. Engler's Bot. Jahrb. 39:666-714. fig. 1. pls. 6-10. 1907.